

# **Do ut des: Do elderly benefit from grandparenting in terms of cognitive abilities?**

Bruno Arpino\* and Valeria Bordone\*\*

\* Department of Political and Social Sciences and RECSM, Universitat Pompeu Fabra, Barcelona (Spain) and Centre for Research on Social Dynamics – Bocconi University, Milano (Italy) – bruno.arpino@upf.edu

\*\* Wittgenstein Centre for Demography and Global Human Capital (IIASA, VID/ÖAW, WU), Vienna University of Economics and Business, Vienna (Austria) – valeria.bordone@wu.ac.at

Paper prepared for the EPC 2012

## **Abstract**

Mental abilities are important to maintain an independent and active life through to old age. Despite the natural decline of cognitive functioning as people become older, cognitive ageing can be prevented and halted. “How” is a topic of high interest in ageing societies. In this paper, we explore to what extent grandparenting, i.e. taking care of grandchildren without the presence of the children’s parents, acts as a protective factor and challenges cognitive ageing. To address reverse causality and other sources of endogeneity, we use an Instrumental Variable approach. The analyses are based on the Survey of Health, Ageing and Retirement in Europe. Past evidence on the topic, mostly limited to grandparents acting as main carer, shows a negative effect of grandparenting on grandparents’ health. We challenge this evidence. We find no significant effect of grandparenting on memory and numeracy skills; while, when considering those forms of cognitive ability which represent products of processing carried out in the past, we do find evidence of strong positive effect of grandparenting.

**Keywords:** grandparents; cognitive abilities; Instrumental Variable approach.

## **1. Introduction**

Maintaining cognitive skills is vital for a good quality of life in old age. Despite the normal cognitive decline with ageing, research has shown that maintaining cognitive functioning through to old ages can be enhanced by social interactions and participation to different types of social activities, from being active in the labour market to attend educational courses, doing voluntary or charity work, providing help to family, friends or neighbours, participating in sport, and engage in a political, religious or community organisations (e.g. Adam et al. 2007; Engelhardt et al. 2010).

A number of studies have shown a positive effect of number of social ties on people's wellbeing (e.g. Bassuk et al. (1999); Fratiglioni et al. (2000); Wilson et al. (2007) on dementia and Alzheimer disease; Glymour et al. (2008) on cognitive recovery after stroke).

Despite these attempts, there is a need to identify “the specific aspects of social integration most important for preserving memory” (Ertel et al. 2008, p.1215). In particular, what so far has not received much attention, though, is the possible cognitive benefit of grandparenting for elderly people. Yet, the widespread increased longevity and the decreased fertility, resulting in “long and thin” family structures (Bengtson 2001) have created an unprecedented opportunity for the grandparent role (cf. Silverstein et al. 1998): the parent-child relationship may indeed last six to seven decades and the grandparent-grandchild bond may hold up to four decades.

Therefore, in this paper we focus on the effect of grandparenting (meant as looking after a grandchild without the presence of the parents) on cognitive abilities of the grandparents. By using an instrumental variable approach on data from the Survey of

Health, Ageing and Retirement in Europe, we aim to assess if grandparental investment in childcare helps in preserving cognitive abilities in later life, despite the ageing process. In doing so, we consider four dimensions of cognitive abilities: verbal fluency, numeracy, immediate recall, and delayed recall.

### **1.1 Intergenerational transfers today**

In an increased diversity of family forms, norms and behaviours, “for a growing number of Europeans, living as a family today means living in longer, thinner, more often de-institutionalized (non-marital), non-co-resident families” (Hantrais 2005: 4), where the horizontal ties within generations tend to decrease and to become more and more age-homogeneous; while the duration of family ties crossing generations has been greatly increasing (Bengtson and Martin 2001).

Indeed, contrary to the *family-in-crisis hypothesis*, which has driven most of the research on the family and intergenerational relationships over the last decades (Popenoe 1993), the family has not been cut back to its essentials: two generations (i.e., the parents and the children) and two functions (i.e., childbearing and the provision of affection and companionship). Although in most developed countries there has been a decline in three or more generation households, family members remain the main source of informal support crossing generations (Attias-Donfut et al. 2005; Blome et al. 2009; Fokkema et al. 2008; Hank 2007; Silverstein and Bengtson 1994). In particular, child care provided by grandparents is a key form of multigenerational family support, as recognised by several U.S. studies (e.g., Fuller-Thomson and Minkler 2001; Hayslip and Kaminski 2005; Pebley

and Rudkin 1999; Vandell et al. 2003) and by the more recent European research on intergenerational relationships (e.g., Hank and Buber 2009). In contrast to the image of elderly, being passive and burdening the children, evidence from many industrialized countries shows that they hold an active and supportive role within the family, especially by taking care of grandchildren (e.g. Attias-Donfut et al. 2005; Vollenwyder et al. 2002).

Even though its frequency greatly varies by country, grandparenting is rather common in modern societies. Because of substantial increases in human life expectancy in industrial societies, grandparents and grandchildren have more shared lifespan than ever before (Murphy and Grundy 2003). As a result, in the so-called “beanpole families” (Bengtson et al. 1990), grandparents are actively engaging to satisfy the demand for childcare. In Europe, 58 per cent of grandmothers and 50 per cent of grandfathers provide regular or occasional care to their grandchildren. In the USA, 43 per cent of grandmothers say they provide regular child care (see Glaser *et al.* 2010 for a review of surveys on grandparents providing childcare). Looking at the regularity of this task, however, tells a different story: a gradient from low to high frequencies of weekly grandchild care runs from the countries with a more developed family welfare to the countries with a poor welfare system. Well-developed welfare systems, providing public support in old age, seem to enable the elderly to support their descendants more than in countries where older people have to rely on an intergenerational upward (wealth) flow of resources (e.g. Kohli 1999; Silverstein 2006). As SHARE data show, among grandmothers involved in weekly grandchild care in Europe, Italian, Greek and Swiss grandmothers are more than twice as likely to be heavily involved in grandchild care (Attias-Donfut et al. 2005).

## **1.2 The effects of grandparenting on other generations**

Grandparent-provided child care is an important transfer within the intergenerational solidarity framework: downward, grandparents invest time and resources on their (grand)children; upward, grandchildren can be an important (emotional) resource for grandparents (e.g., Bass and Caro 1996; Brandon 2000; Silverstein et al. 2003).

So far, the literature on intergenerational transfers involving grandparents has mostly focused on the downward effects of grandparenting, both towards children and grandchildren. For example, Aassve et al (2011a) and Arpino et al (2010) show that grandparenting has an important role in helping mothers balancing a working career and family in several European countries (see also Gray 2005). There is also evidence that the availability of grandparents affects their children's fertility decisions: the availability of informal child care through the child's grandparents increases the likelihood of childbearing (Aassve et al. 2011b; Del Boca 2002; Hank and Kreyenfeld 2003).

Moreover, the effects of grandparents' childcare on grandchildren, with respect to outcomes such as school performance, dietary habits, cognitive skills, etc. have been widely explored (e.g. DeLeire and Kalil 2002; Dunifon and Kowaleski-Jones 2007; Monserud and Elder 2011). Although often these studies had a particular focus on children raised solely by grandparents, some research from the UK indicates that grandparental involvement is linked to better emotional adjustment and fewer behavioural problems among adolescents. Similarly, US research shows that children with strong relationships with grandparents

have fewer depressive symptoms than those with weak grandparent relationships (e.g. Coall and Hertwig (2011) for a review).

There is also evidence that the welfare system benefits from grandparental care. Child welfare agencies in the U.S. appear to rely more and more on the availability of grandparents to provide care for their grandchildren (Hughes et al. 2007). Thus, grandparental informal, unpaid care to children has a widely beneficial, but often unacknowledged, impact on society.

### **1.3 The effect of grandparenting on grandparents**

The investment of grandparents in time and resources for the grandchildren can also have benefits for the donor in terms of reciprocal support as well as emotional and health benefits gained from the very act of investing (Coall and Hertwig 2011). Yet, the effects of grandparenting on grandparents have received only little attention.

The limited evidence on the impact of care on grandparents' health (see Grinstead et al. (2003); Hayslip and Kaminski (2005); and Minkler (1999) for comprehensive reviews) points to the fact that “although social relationships are beneficial for health, family relationships [...] involving caregiving, may not always be salubrious” (Hughes and Waite 2002). One might think that this outcome derives from the fact that much of the earlier evidence on the impact of grandparental care on well-being is based on small scale studies, often involving convenience samples (Grinstead et al. 2003). Yet, also more recent research, based on nationally representative surveys such as the NSFH, the 1988 U.S. National Health Interview Survey (NHIS), and the U.S. Census 2000 Supplementary

*Do elderly benefit from grandparenting in terms of cognitive abilities?*

Survey/American Community Survey, has found poorer outcomes for grandparents (Baydar and Brooks-Gunn 1998; Goodman and Silverstein 2002; Minkler and Fuller-Thomson 2005; Pruchno and McKenney 2002; Solomon and Marx 1999).

One reason for the general negative effect of grandparenting found in previous studies (despite a little contrasting evidence, e.g. Baker and Silverstein (2008)) could be the attention drawn to problematic situations, such as full care in case of a skipped generation (e.g. Hughes et al. 2007). Grandparents raising their grandchildren may lack privacy and leisure time, have less contact with friends and be at risk of isolation (Fergusson et al. 2008; Giarrusso et al. 2001; Jendrek 1993). It is surprising that only a small number of studies focus on grandchild care as complementary to parental childcare (rather than on custodial grandparenting), even though it occurs far more commonly.

Contrary to being a primary caregiver, being a safety net to grandchildren when needed may have positive effects on grandparents' wellbeing, enhancing their sense of purpose in life and maintaining their family identity (Giarrusso et al. 2001; Jendrek 1993; for review see Hayslip and Kaminski 2005). In support to this idea, a recent work by Powdthavee (2011) on the UK, for example, showed that being a grandparent to at least one grandchild is associated positively and statistically significantly with individuals reporting to be very satisfied with life overall. Moreover, Hughes and colleagues (2007) found that grandmothers who babysat their grandchildren not only reported better health right after, but also 2 years later they were more likely to exercise than those grandparents who did not babysit. The effect held even adjusting for the grandparents' initial health status. In contrast, Baydar and Brooks-Gunn (1998) found no significant differences in the level of

depressive symptoms between caregiving and non-caregiving grandmothers; however, the intensity of caregiving in their study was only “once a month or more”.

Given that so far most of the literature and research on health effects of grandparenting has been concerned with heavily-committed grandparents, many researchers agree that more study is needed in this area (e.g., Muller and Litwin 2011). In particular, there is a need “to parse out how much of the apparent negative effect of grandparenthood may be based on selection effects” (Umberson et al. 2010).

The grandparent role is directly linked to the distribution of responsibility between the family and the welfare system in caring for the young generation. It is important, therefore, that together with the increasing demographic attention on mental abilities and health in ageing societies (Batty et al. 2007; Deary et al. 2005; Gottfredson 2004; Whalley and Deary 2001), we increase the knowledge on the effect that the grandparent-grandchild relationship has on the cognitive abilities of the elderly.

This paper aims to contribute filling this gap in the literature by focusing on the effect of grandparenting on the level of cognitive abilities for people aged 50+ in Europe.

#### **1.4 Cognitive skills in later life**

The natural decline of cognitive abilities with age is a characteristic trait of the aging process, in particular after the fifth decade of life (Schaie 1989). One debated conceptual framework (Cattell 1943; Horn and Cattell 1967), distinguishes between two types of abilities: fluid and crystallized abilities. Fluid abilities consist of the basic mechanisms of processing information. Therefore, these abilities are closely related to biological and



*Do elderly benefit from grandparenting in terms of cognitive abilities?*

physical factors. One important aspect of fluid abilities is the speed with which many operations can be executed. Crystallized abilities consist of the knowledge acquired during the life, with education and other life experiences. Unlike fluid abilities, which are subject to a clear decline as people grow older, crystallized abilities tend to be maintained until later in life. More general consensus has gained the distinction between two patterns of age-cognition relations: on one hand, measures representing products of processing carried out in the past tend to increase, at least until people are in their 60s. Among these measures are classified vocabulary and general information in which the relevant acquisition occurred earlier in one's life. On the other hand, measures representing efficiency or effectiveness of processing carried out at the time of assessment, usually involving manipulations or transformations of abstract or familiar material, are subject to a nearly linear decline from early adulthood on. As argued by Salthouse (1985), dimensions of cognitive functioning such as fluency, numeracy and memory, are generally based on different combinations of fluid and crystallized intelligence.

Theories about cognitive skills of ageing individuals have been formulated in different areas of research. First, psychological theories stress underlying common causes of the general cognitive decline with age, such as the hypothesis of generalized slowing or link with sensory acuity (Baltes and Lindenberger 1997; Baltes and Mayer 1999; Schaie and Willis 1993). Second, biologists highlight the overall age-related decline in organ functions, including the neurological function. Multiple illnesses or impairments and chronic diseases might explain between-person differences in rates of change as exogenous influences on cognitive function (Waldstein 2000; Waldstein and Elias 2001). Third,

sociological theories of disablement and cumulative disadvantage posit that social processes account for health (including cognitive functioning) disparities and differences in rates of change (Dannefer 2003; Verbrugge and Jette 1994). What we know about the complex process of age-related neurodegeneration is that higher levels of cognitive abilities allow the individuals to prevent or slow down the organic process of aging (Stern 2002).

Several empirical studies highlight that not only genetic differences, but also life events (e.g. education (Le Carret et al. 2003) or being active in the labour market (Adam et al. 2007; Mazzonna and Peracchi 2010)) may affect the cognitive endowment and the rate of cognitive decline over age. Another strand of the literature shows that elderly people involved in leisure and social activities tend to have better mental well-being because they benefit from being part of supportive social networks and they feel useful (Engelhardt et al. 2010; Scarmeas and Stern 2003; Trouton et al. 2006). Psychological studies have shown that in old age even positive illusions of being useful may be beneficial to the sense of control of the individuals. Langer and Rodin (1976) have studied this effect in a field experiment conducted in a nursing home. Subjects were divided into a control group for which nothing changed, and an experimental group who was allowed for enhanced control. This latter group could, for example, take care for plants or choose between scrambled eggs or omelette for breakfast. After one and a half years, the experimental group showed lower mortality, had a higher activity level, and reported more feelings of happiness than the control group. Based on this study, Searle et al. (1995) proposed a control-enhancing intervention for older adults living independently who were at risk of losing an important component of their independence (i.e. they had ceased participating in a favourite leisure

*Do elderly benefit from grandparenting in terms of cognitive abilities?*

activity). Compared to the random control group, the participants who received the intervention enabling them to plan their future recreation effectively showed significant increases in leisure-related perceived control.

Recent demographic studies have additionally stressed the importance of understanding cognitive development in old age: modern societies shifting more of the responsibility associated with planning and managing the retirement years (financially and health-related) toward individuals, implicitly raise the importance that the capacity of the individual is maintained in later life (e.g. Hauser and Weir 2010). Preventing or halting cognitive ageing is therefore a goal of both growing old individuals and ageing societies.

## **2. Grandparenting and cognitive skills: Hypotheses**

Grandparenting is an important part of social interaction in the later stages of life, when the number of social roles available to a person decreases and their content tends to tail off. Yet, for the best of our knowledge, the effect of grandparenting has not been considered in studies of cognitive abilities in old age.

In order to study the effect of grandparenting on grandparents' cognitive abilities, we follow the line of research based on the simple motto "use-it-or-lose-it" (Rohwedder and Willis 2010): an undemanding environment may even accelerate the process of cognitive decline; on the contrary, engage in cognitively stimulating activities may halt the process of ageing. Taking care of a grandchild is a particularly stimulating activity for elderly people's brain as it provides caregivers with responsibilities and makes them interacting with younger generations (e.g., doing homework). This in turn, results in an increase of elder's

vitality (Caren 1991; Kornhaber 1996). Childcare tends also to favour healthy behaviours, such as active lifestyle, healthier meals, or a reduction in smoking: all activities that have been shown to positively affect cognitive functioning in middle and old age (e.g. Kalmijn et al. 2002). Furthermore, grandparents may find caring for a grandchild rewarding and therefore derive from it psychological benefits (Pruchno and McKenney 2002): it has been shown that some grandparents feel that caring for their grandchildren makes them healthier and more active (Waldrop and Weber 2001), increasing both their satisfaction and emotional closeness (Drew and Silverstein 2007). The benefits of grandparenting may therefore mitigate or even outweigh the expected costs of caregiving demands.

However, the effect of grandchildren on grandparents' cognitive benefits may be a double edge sword: grandparents who actively contribute to grandchild care may feel physically tired and emotionally drained by childcare demands (e.g. Jendrek 1993); also, grandparenting may subtract time from self-care (Roe et al. 1996) or hobbies and other types of social engagement (Pruchno 1999). In this respect, Muller and Litwin (2011) found the centrality of the grandparent role to be largely unrelated to the psychological well-being of grandparents.

We do not know a priori if the negative or positive effect of grandparenting on grandparents' cognitive skills will prevail. We start from the assumption that grandparenting is an alternative activity to those social activities that are positively affecting cognitive performance.

## *Do elderly benefit from grandparenting in terms of cognitive abilities?*

H1: If caring for a grandchild positively acts on the feelings of happiness of the elderly people, makes them feeling useful and engaging in active behaviours, cognitive abilities would be maintained or even enhanced.

H2 (alternative): If the stressful and time-consuming dimension of caring for a grandchild prevails, grandparenting would result in a decline of cognitive abilities.

### **3. Data and method**

Our analyses are based on the f waves of the Survey of Health, Ageing and Retirement in Europe (SHARE, 2004 and 2006). SHARE is a multidisciplinary cross-national survey, representative of the population aged 50 and over (Boersch-Supan et al. 2005; 2008). The countries analyzed are: Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Ireland, Israel, Italy, Poland, Spain, Sweden, Switzerland and The Netherlands. We use data from the first wave and the refresher sample from the second wave for those countries that participated into both the 2004 and 2006 data collection. We use the second wave for the countries that joined SHARE in 2006 (i.e. Czech Republic, Poland and Ireland). We only consider one observation for each respondent (i.e. the grandparent) and do not take a panel approach for reasons that we discuss in the section 3.2.

#### **3.1. Sample selection and variable construction**

In order to define our sample, we exclude grandparents-headed families, because in this case the role of grandparents, and their burden in terms of responsibility and time use, is completely different as compared to the case of grandparents who contribute, more or

less frequently, to grandchild care. The sample is additionally reduced by excluding respondents that, due to health problems, would not be “at risk” of grandparenting (see section 3.2 for a further explanation).

Information on grandparenting is obtained from two items: *“During the last 12 months, have you regularly or occasionally looked after your grandchild(ren) without the presence of the parents?”* And, if the answer is “Yes”, it is asked *“During the last 12 months, on average, how often did you look after the child(ren) of child name, without the presence of the parents?”* The possible answers are *“Almost daily”, “Almost every week”, “Almost every month”, “Less often”*.

Five cognitive functions are measured for all respondents in SHARE: fluency, numeracy, immediate recall, delayed recall and orientation. In the current study, orientation (i.e. remembering date, month, year and day of the week) was not included due to a small variation across age and to the fact that it is more appropriate for detecting really severe cognitive deficits (see Engelhardt et al. 2010 for a discussion). Table 1 provides some descriptive statistics on the cognitive variables taken into account (the minimum and maximum values, the mean and the standard deviation of the scores, along with the quartiles).

The test of verbal fluency consists of counting how many distinct elements belonging to a particular category the respondent can name in a specific time interval. In SHARE the test is carried as follows: *“Now I would like you to name as many different animals as you can think of. You have one minute to do this.”* As Table 1 shows, the range goes from 0 to 38, once it is clean from the presence of outliers (if outliers were included, the range would

*Do elderly benefit from grandparenting in terms of cognitive abilities?*

reach a maximum of 100, with a mean value of slightly less than 20). One quarter of the respondents listed no more than 15 animals and 50% no more than 19.

The test of numeracy consists of a few questions assessing how people use numbers in everyday life (see Appendix 1 for a complete list of the questions), as for example: *“If the chance of getting a disease is 10%, how many people out of 1,000 would be expected to get the disease? Answers not read out: 1. 100; 2. 10; 3. 90; 4. 900; 97. Other answer”*. The numeracy score ranges from 0 to 5 with a median value of 3.6.

The test of memory consists of verbal registration and recall of a list of 10 words. The SHARE questionnaire reads as follows: *“I am going to read a list of words from my computer screen. We have purposely made the list long so it will be difficult for anyone to recall all the words. Please listen carefully, as the set of words cannot be repeated. When I have finished, I will ask you to recall aloud as many of the words as you can, in any order.”* The memory test is carried out two times, immediately after the encoding phase (immediate recall) and at the end of the cognitive function module (delayed recall). In both cases, respondents are asked to list all the words that they can remember within one minute. As Table 1 shows, 50% of elderly were not able to remember more than 5 words (out of the 10 read out by the interviewer) immediately after listening them and 75% were not able to remember more than 5 in the delayed recall.

For the cognitive measures, we have excluded the outliers, that is cases outside the range of +/- 2 standard deviations<sup>1</sup>.

---

<sup>1</sup> The regression analyses have been carried out using both dependent variables with and without the outliers and results were not significantly different. We have therefore retained the models using variables cleaned from the outliers.

The final sample for the descriptive analyses had 7967 people for the analysis of verbal performance, 7910 for the analysis of numeracy, 8075 people tested for immediate recall and 8044 for delayed recall. The samples used for the multivariate analyses are slightly reduced (as reported in Table A1 and A2 in Appendix 2) as missing or unreliable data for one of the variables retained in the analysis was another criterion for exclusion.

Table 1 – Descriptive statistics on the four cognitive skills outcome variables

	Verbal fluency	Numeracy	Immediate recall	Delayed recall
Min	0	1	0	0
Max	38	5	9	8
Mean	19.6	3.6	5.2	3.7
Sd	6.6	1.1	1.7	1.8
Q1	15	3	4	2
Q2	19	4	5	4
Q3	24	4	6	5
Verbal fluency	1.000			
Numeracy	0.314	1.000		
Immediate recall	0.354	0.290	1.000	
Delayed recall	0.309	0.267	0.614	1.000
N	7967	8110	8075	8044

Note: The variables are cleaned of the outliers. Q1-Q3 are the first, second and third quartiles. Source:

SHARE, 2004; 2006. Authors' elaboration.



## *Do elderly benefit from grandparenting in terms of cognitive abilities?*

As for the correlations between test scores (bottom part of Table 1), immediate and delayed recall have the highest correlation (above 0.6), and the correlations between all other domains are between 0.3 and 0.4.

In the regression analyses we control for gender, age, education (none or primary school: ISCED 0-1 and lower secondary: ISCED 2; higher secondary: ISCED 3-4; tertiary education: ISCED 5-6), marital status (0 = not living with a partner; 1 = living with a partner), working status (employed; retired; other (i.e. unemployed, homemaker, other)), country (14 dummy variables).

### **3.2. Identification issues and the Instrumental Variable approach**

Drawing empirically causal conclusions on the link between grandparenting and grandparents' cognitive skills is a difficult task because of endogeneity problems. First, grandparents' observed and unobserved characteristics might be different from that of non-grandparents and can be associated with cognitive abilities. Moreover, we face a problem of reverse causality: it can be that grandparental care helps elderly people to maintain good cognitive abilities or that mentally healthy grandparents are more likely to take the responsibility of caring for their grandchildren.

One possibility to deal with these endogeneity problems is to consider only grandparents interviewed twice in SHARE and use a fixed-effect approach. As we already anticipated, we decided to avoid this approach and consider only one observation for each grandparent. The reasons are twofold.

First, repeated exposure to the same tests may induce learning effects which are likely to improve the cognitive scores of some respondents (as argued in Mazzonna and Peracchi 2010; Schaie and Hofer 2001 discuss the drawback of retest effects in longitudinal studies of cognition). Second, attrition is a serious issue in panel surveys on elderly (in SHARE about one third of the original sample is lost). Zamarro et al. (2008) find that people in poor health and with poor cognitive abilities are more likely to drop out of the panel.

Instead of a fixed-effect model, we deal with the endogeneity issues by implementing an instrumental variable approach. Our instrument is the availability of grandchildren (a binary variable taking value 1 if the elderly has at least one child and 0 otherwise), which is expected to affect grandparents probability to provide grandparental childcare but not to have direct impact on grandparents cognitive abilities. The exogeneity of the instrument could be violated if, for example, respondents' children have decided to have children accordingly to the health status of their parents. However, this should not be a problem in our analysis because we exclude those who do not have children and those who had serious health problems. In order to restrict the analysis to "healthy" respondent, we followed selection criteria similar to those of Adam et al. (2007) and Engelhardt et al. (2010): those who reported a stroke, Parkinson's disease or cancer were excluded. Additionally, we also excluded respondents who reported to be permanently sick or disabled. In fact, it is well-known that stroke and cardiovascular diseases (Schatz and Buzan 2006; Schmidt et al. 1993), Parkinson's disease (Norman et al. 2002; Rasquin et al. 2004), as well as anti-cancer drugs (Falletti et al. 2006; Winocur et al. 2006) can negatively affect cognitive abilities.

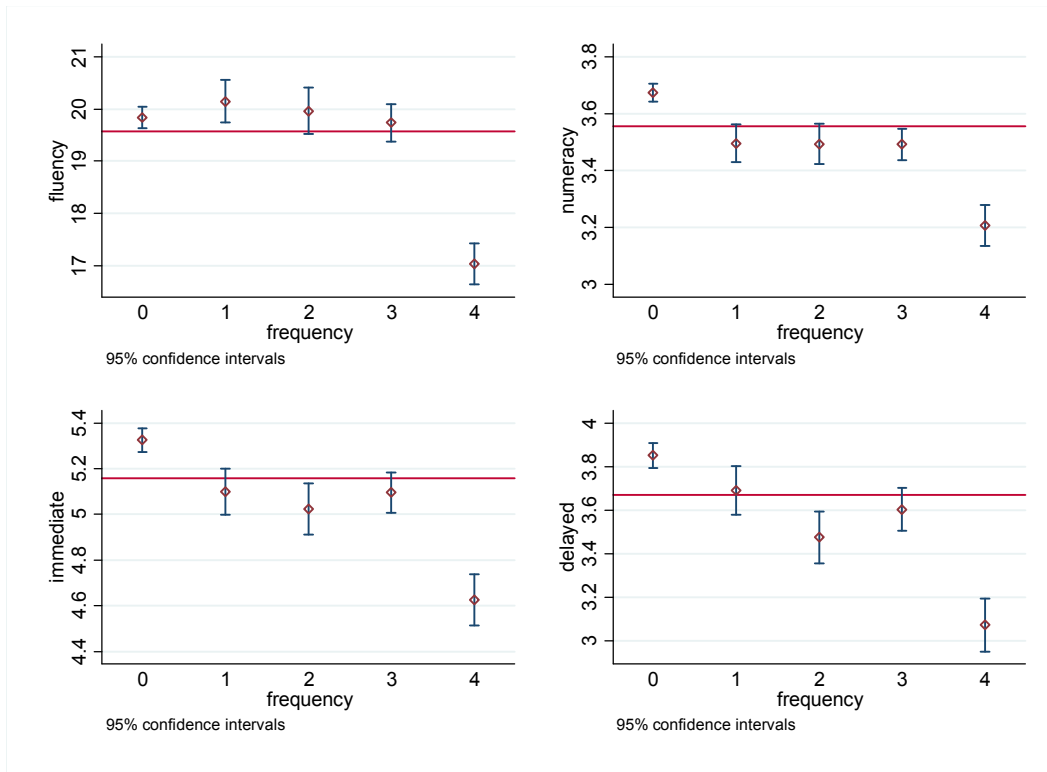
On the other hand, we can expect that having these diseases decreases the probability to spend time alone with grandchildren both because grandparents are less able (from a physical point of view) to take care of grandchildren and because parents might not trust leaving their (young) children with unhealthy elderly. Excluding from the sample elderly people that have ever had these diseases increases the comparability of grandparents in the treated and control groups. We then control for the socio-economic and demographic characteristics of the elderly people involved in the analysis, as described in section 3.1.

## **4. Results**

### **4.1. Descriptive findings: Selection on observables**

A comparison of the average cognitive abilities between those who take care of grandchildren and those who do not, shows the first having some kind of disadvantage. In fact, as shown in Figure 1, grandparents who care on a daily basis for grandchildren (= 4 on the x-axis) have lower cognitive abilities than grandparents who do not (either because they have no grandchildren (= 0) or because they take care of their grandchildren less regularly (= 1-3)).

Figure 1 – Cognitive abilities (mean and 95% confidence interval) by amount of grandparental childcare.



Note: on the horizontal axis, 0 = no grandchildren; 1 = less than monthly; 2 = almost every month; 3 = almost every week; 4 = almost daily. Source: SHARE, 2004; 2006. Authors' elaboration.

These descriptive results could be due to a sort of “negative” self-selection of elderly people providing childcare. Indeed, a first hint in this direction is provided by the gender-unbalanced sample of grandparents who do grandparenting: almost 66% of the grandparents who look after a grandchild with daily frequency are women. As we learn from the literature and from our SHARE sample, women have on average higher cognitive abilities than men. The “negative” self-selection of grandparenting clearly emerges also from the other descriptive statistics presented in Table 2. Not only grandparents who care for a grandchild are less likely to be active in the labour market but they are also less likely

*Do elderly benefit from grandparenting in terms of cognitive abilities?*

to be highly educated (which, as described in the literature, would allow maintaining higher cognitive abilities).

Table 2 – Daily grandparenting, gender, education and working status (%).

	Female	Low education	Middle education	High education	Employed
Daily	66	54	36	10	18
Not-daily (including no grandchildren)	53	36	39	25	49
Not-daily (excluding no grandchildren)	60	42	39	20	33

Source: SHARE, 2004; 2006. Authors' elaboration.

#### **4.2. Instrumental Variable model results**

The previous section has presented the association between cognitive functioning and the frequency of grandparenting.

Table 3 presents the results from the OLS regression, using the full sample. The analyses are carried out first regressing “daily grandparenting vs. other” and then “weekly grandparenting vs. other” on the four cognitive outcomes. Eight models are carried out. The estimated coefficients related to a frequent grandparent activity are never highly statistically significant.

However, as stated above, this relationship is likely to be driven either by the presence of unobserved heterogeneity that might be correlated both with cognitive functioning and the frequency of grandchild care, or by the endogeneity of the frequency of care with cognitive functioning.

Table 3 – Estimates of the effect of grandparenting on several measures of cognitive skills.

Grandparenting		Verbal fluency	Numeracy	Immediate recall	Delayed recall
Almost daily	OLS estimate	-0.140	-0.027	-0.074	-0.121
	robust s.e.	0.224	0.036	0.058	0.065
	p-value	0.532	0.461	0.204	0.062
Almost weekly	OLS estimate	0.283	0.004	0.009	0.006
	robust s.e.	0.155	0.025	0.040	0.045
	p-value	0.069	0.874	0.826	0.902

Note: The model controls for the relevant characteristics of the grandparents (i.e. age, education, gender, marital status, working status, country), as reported in Table A1 in Appendix 2. Source: SHARE, 2004; 2006.

Authors' elaboration.

In order to shed light on the causal effect of grandparenting and cognitive functioning, we estimate the effect of providing grandparental childcare on grandparents' cognitive skills by using a Two Stage Least Square estimator (2SLS). Our instrument, having at least one grandchild, passes the F-test of relevance. The aim of the following analyses is to assess whether the amount of care provided by grandparents to their grandchildren makes a difference on their own cognitive status. To assess if the effect of grandparenting depends on its frequency, we use two different specifications of our treatment variable: first, we contrast those providing grandchild care almost on a daily basis versus the others; in a second step, we define as grandparenting the activity of providing care to grandchildren almost weekly. The effect of grandparenting on cognition is estimated by carrying out four models, one for each dimension of cognitive abilities tested in the SHARE survey: verbal fluency, numeracy, immediate recall, and delayed recall.

*Do elderly benefit from grandparenting in terms of cognitive abilities?*

The results of the 2SLS estimates of the effect of taking care for grandchildren on the four measures of cognitive skills are reported in Table 4 (summary results for first-stage regressions are reported in Table A3 in the Appendix 2). The outcome of our analyses shows that grandparenting has a positive (or null in case of numeracy) impact on all the measures of cognitive abilities. However, the effect is statistically significant only for verbal fluency. Moreover, such an effect is always stronger when we consider daily grandparenting. The analyses have been carried out also by gender, with similar results (available on request).

Table 4 – 2SLS Estimates of the effect of grandparenting on several measures of cognitive skills.

Grandparenting		Verbal fluency	Numeracy	Immediate recall	Delayed recall
Almost daily	estimate IV	3.013	-0.093	0.178	0.220
	robust s.e.	0.715	0.120	0.190	0.206
	p-value	0.000	0.437	0.349	0.285
Almost weekly	estimate IV	1.125	-0.034	0.066	0.082
	robust s.e.	0.265	0.044	0.07	0.076
	p-value	0.000	0.437	0.348	0.284

Note: The model controls for the relevant characteristics of the grandparents (i.e. age, education, gender, marital status, working status, country), as reported in Table A2 in Appendix 2. Source: SHARE, 2004; 2006. Authors' elaboration.

The protective effect of grandparenting on verbal fluency can be illustrated by predicting cognitive skills of elderly at different education levels. From our model estimates we find that a person with low education (here defined as lower secondary

attainment or below) who acts as a grandparent tends to approach the fluency cognitive level of a person with tertiary education who does not look after the grandchildren. Similarly, a grandparent with low education and active in grandchild care on a weekly basis has a verbal fluency performance that approaches the level of middle educated (higher secondary attainment) elderly not grandparenting.

## **5. Discussion and concluding remarks**

In a context of ageing societies, with a natural decline of cognitive abilities, it becomes more and more important to focus on the factors that may help elderly people maintaining mental health. Grandparenting is a voluntary social activity that gives the grandparents a sense of responsibility and involves them in tasks based on intergenerational exchange. Although it is a widespread activity among European seniors, no previous study has to our knowledge investigated in detail its possible effects on grandparents' cognitive abilities.

Descriptive analyses on the SHARE database make us thinking of grandparenting as a negative activity for grandparents' cognitive abilities: elderly people taking care on a regular basis of their grandchildren (either with a daily or weekly frequency) seem to have lower cognitive abilities than their counterparts not doing grandchild care. A similar hint would come from using OLS regression models that do not account for selection and do not address endogeneity.

This conclusion is however reversed using an instrumental variable approach that deals with the endogeneity of grandparenting: grandparents' observed and unobserved



*Do elderly benefit from grandparenting in terms of cognitive abilities?*

characteristics might be different from those of non-grandparents and can be associated with cognitive abilities. Once we carry out multivariate regressions, controlling for the negative selection of who does grandchild care, the findings do not support the hypothesis of a negative effect of grandparenting on cognitive functioning (H2): none of the cognitive dimensions considered grandparenting is negatively affected by grandparenting. From this study, it rather emerges that grandparenting is beneficial for grandparents' cognitive abilities (in favour of H1). This result holds particularly true for what it concerns fluency performance. An explanation of the stronger impact of grandparenting on verbal fluency rather than on the other measures of cognitive abilities used in this study, refers to the distinction between the various types of cognitive domains discussed in the introductory section. Indeed, crystallized abilities to which fluency belongs, are recognized to be more amenable to change as they rely on specific acquired knowledge. On the contrary, memory (i.e. immediate and delayed recall) involves a timing aspect and a processing speed component which show a more pronounced decline with age and leave less room to changes. Although numeracy is often classified as a crystallized ability, together with fluency, this measure of cognitive functioning is an assessment more of fluid than crystallized intelligence, as it partly involves processing of new information (at least for some sub-samples).

We acknowledge that our study may be challenged by some drawbacks which further analyses may try to overcome. First, the time declared as dedicated to grandchild care might not correspond to the actual time spent by the grandparent alone with the grandchild (Folbre et al 2005): we could try to exclude from the analysis those grandparents that are

living in the same house(hold) of the children having own children; however SHARE does not ask directly whether the grandparent lives with any grandchild. Second, above the age of 75 the process of cognitive ageing may tend to be particularly steep and this may partly account for the non-significant effect of grandparenting: a selection of the sample excluding the “oldest-olds” may reveal such an issue. Third, those social activities that have been found to maintain cognitive abilities (Engelhardt et al. 2010) might be simultaneously competing with the activity of caring for grandchildren: additional robustness checks may help strengthen our results.

Despite these challenges, the evidence produced by this study contributes not only to the discussion on age-related cognitive decline (i.e. on productivity (Engelhardt et al. 2010), but also on the debate on the intergenerational transfers balance (e.g., de Jong Gierveld 2011).

Our findings suggest that the health disadvantages found previously among grandparent caregivers arise from grandparents’ prior characteristics, not as a consequence of providing care. Hughes et al. (2007) had already highlighted that, controlling for the observables, health decline as a consequence of grandchild care is the exception rather than the rule. We add to the previous evidence that also after controlling for endogeneity (observables and unobservables), there is no negative effect of grandparenting on elderly’s well-being. Given the still present reliance on grandparents for day care and increasing reliance on grandparents for custodial care in modern ageing societies, it is of high relevance the outcome of this study: grandparents caring for their grandchildren on a regular basis benefit in terms of preventing fluency-related cognitive decline.

*Do elderly benefit from grandparenting in terms of cognitive abilities?*

Future research may consider that grandparental resources are multidimensional in nature (Coall and Hertwig 2011): grandparental investment is reflected in practical and financial help, food production, time in the form of childcare, or simply the emotional support provided by a listening ear. All these dimensions may have (different) effects on the cognitive abilities of grandparents.

## References

- Aassve, A., Arpino, B., & Goisis, A. (2011). *Grandparenting and mothers' labour force participation: A comparative analysis using the Generations and Gender Survey*. Dondena Working paper 36.
- Aassve, A., Meroni, E., & Pronzato, C. (2011). *Grandparenting and childbearing in the extended family*. Dondena Working paper 38.
- Adam, S., Bonsang, E., Germain, S., & Perelman, S. (2007). *Retirement and cognitive reserve: A stochastic frontier approach applied to survey data*. HECULg, CREPP working papers 2007/04.
- Arpino, B., Pronzato, C., & Tavares, L. P. (2010). All in the family: Informal childcare and mothers' labour market participation. Working Paper of the Institute for Social and Economic Research (ISER), Colchester: University of Essex.
- Attias-Donfut, C., Ogg, J., & Wolff, F.-C. (2005). Family support. In A. Boersch-Supan, A. Brugiavini, H. Juerges, J. Mackenbach, J. Siegriest, & G. Weber (Eds.), *Health, Ageing and Retirement in Europe. First Results from the Survey of Health, Ageing and Retirement in Europe*. Mannheim: Mannheim Research Institute of the Economics of Aging.
- Baker, L. A., & Silverstein, M. (2008). Preventive health behaviors among grandmothers raising grandchildren. *Journals of Gerontology Series B-Psychological Sciences and Social Sciences*, 63, S304-S311.
- Baltes, P. B., & Lindenberger, U. (1997). Emergence of a powerful connection between sensory and cognitive functions across the adult life span: A new window to the study of cognitive ageing. *Psychology and Aging*, 12, 12-21.
- Baltes, P. B., & Mayer, K. U. (1999). *The Berlin Aging Study: Aging from 70 to 100*. Cambridge, UK: Cambridge University Press.
- Bass, S. A., & Caro, F. G. (1996). The economic value of grandparent assistance. *Generations*, 20, 29-33.
- Bassuk, S. S., Glass, T. A., & Berkman, L. F. (1999). Social disengagement and incident cognitive decline in community-dwelling elderly persons. *Annals of Internal Medicine*, 131 (3), 165-173.
- Batty, G. D., Deary, I. J., Schoon, I., & Gale, C. R.. (2007). Mental ability across childhood in relation to risk factors for premature mortality in adult life: the 1970 British Cohort Study. *J Epidemiol Community Health*, 61, 997-1003.
- Bengtson, V. L. (2001). Beyond the nuclear family: The increasing importance of multigenerational bonds. *Journal of Marriage and Family*, 63, 1-16.
- Bengtson, V. L., & Martin, P. (2001). Families and intergenerational relationships in aging societies: Comparing the United States with German-speaking countries. *Zeitschrift für Gerontologie und Geriatrie*, 34, 207-217.
- Bengtson, V. L., Rosenthal, C., & Burton, L. M. (1990). Families and aging: Diversity and heterogeneity. In R. Binstock & L. George (Eds), *The handbook of aging and the social sciences* (pp. 263-287). San Diego: Academic Press.

- Blome, A., Keck, W., & Alber, J. (Eds.). (2009). *Family and the welfare state in Europe. Intergenerational relations in ageing societies*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar.
- Börsch-Supan, A., Brugiavini, A., Jürges, H., Kapteyn, K., Mackenbach, J., Siegrist, J., & Weber, G. (2008). *Health, ageing and retirement in Europe (2004-2007). Starting the longitudinal dimension*. Mannheim: Mannheim Research Institute for the Economics of Aging (MEA).
- Boersch-Supan, A., Brugiavini, A., Juerges, H., Mackenbach, J., Siegrist, J. & Weber, G. (2005). *Health, Ageing and Retirement in Europe. First results from the Survey of Health, Ageing and Retirement in Europe*. Mannheim: Mannheim Research Institute for the Economics of Aging (MEA).
- Brandon, P. D. (2000). An analysis of kin-provided child care in the context of intrafamily exchanges: Linking components of family support for parents raising young children. *American Journal of Economics and Sociology*, 59, 191-216.
- Baydar, N., & Brooks-Gunn, J. (1998). Profiles of grandmothers who help care for their grandchildren in the United States. *Family Relations*, 47, 385-393.
- Caren, L. D. (1991). Effects of exercise on the human immune system. *Bioscience*, 41, 410-416.
- Cattell, R. B. (1943). The measurement of adult intelligence. *Psychological Bulletin*, 40, 153-193.
- Coall, D. A., & Hertwig, R. (2011). Grandparental investment: A relic of the past or a resource for the future? *Psychological Science*, 20, 93-98.
- Dannefer, W. D. (2003). Cumulative advantage/disadvantage and the life course: Cross-fertilizing age and social science theory. *Journal of Gerontology: Social Sciences*, 58B, S327-S357.
- Deary, I. J., Harris, S. E., Fox, H. C., Hayward, C., Wright, A. F., Starr, J. M., & Whalley, L. J. (2005). KLOTHO genotype and cognitive ability in childhood and old age in the same individuals. *Neurosci Lett*, 378, 22-7.
- DeLeire, T., & Kalil, A. (2002). Good things come in threes: Single-parent multigenerational family structure and adolescent adjustment. *Demography*, 39, 393-342.
- Del Boca, D. (2002). The effect of child care and part-time opportunities on participation and fertility decisions in Italy. *Journal of Population Economics* 15:549-73.
- Drew, L. M., & Silverstein, M. (2007). Grandparents' well-being after loss of contact with their grandchildren. *J Fam Psychol*, 21, 372-379.
- Dunifon, R., & Kowaleski-Jones, L. (2007). The role of grandparents in single-mother families. *Journal of Marriage and Family*, 69, 465-481.
- Engelhardt, H., Buber, I., Skirbekk, V., & Prskawetz, A. (2010). Social involvement, behavioural risks and cognitive functioning among older people. *Ageing & Society*, 30, 779-809.
- Ertel, K. A., Glymour, M. M., & Berkman, L. F. (2008). Effects of social integration on preserving memory function in a naturally representative US elderly population. *American Journal of Public Health*, 98 (7), 1215-1220.

- Falletti, M., Sanfilippo, A., Maruff, P., Weih, L., & Phillips, K.-A. (2006). The nature and severity of cognitive impairment associated with adjuvant chemotherapy in women with breast cancer: A meta-analysis of the current literature. *Brain and Cognition*, 59, 1, 60–70.
- Fergusson, E., Maughan, B., & Golding, J. (2008). Which children receive grandparental care and what effect does it have? *Journal of Child Psychology and Psychiatry*, vol. 49, 161-169.
- Folbre, N., Yoon, J., Finnoff, K., & Fuligni, A. (2005). By what measure? Family time devoted to children in the U.S. *Demography*, 42, 373–390.
- Fratiglioni, L., Wang, H-X., Ericsson, K., Maytan, M., & Winblad, B. (2000). Influence of social network on occurrence of dementia: A community-based longitudinal study. *The Lancet*, 355 (9212), 1315-1319.
- Fuller-Thomson, E., & Minkler, M. (2001). American grandparents providing extensive child care to their grandchildren. *Gerontologist*, 41, 201-209.
- Goodman, C., & Silverstein, M. (2002). Grandmothers raising grandchildren: Family structure and well-being in culturally diverse families. *The Gerontologist*, 42, 676–689.
- Gray, A. (2005). The changing availability of grandparents as carers and its implications for childcare policy in the UK. *Journal of Social Policy*, 34, 557-577.
- de Jong Gierveld, J. (2011). Coresidence, familial support exchanges and loneliness of older adults. Netherlands Interdisciplinary Demographic Institute (downloaded from [http://www.demografia.hu/letoltes/ggp/A1\\_1.pdf](http://www.demografia.hu/letoltes/ggp/A1_1.pdf) on 24.05.2012).
- Fokkema, T., ter Bekke, S., & Dykstra, P. A. (2008). *Solidarity between parents and their adult children in Europe*. NIDI report nr. 76. Amsterdam: Netherlands Interdisciplinary Demographic Institute, KNAW Press.
- Giarrusso, R., Feng, D., Silverstein, M., & Bengtson, V. L. (2001). Grandparent-adult grandchild affection and consensus - Cross-generational and cross-ethnic comparisons. *Journal of Family Issues*, 22, 456-477.
- Glaser, K., Ribé Montserrat, E., Waginger, U., Price, D., Stuchbury, R., & Tinker, A. (2010). *Grandparenting in Europe*. London: Grandparents Plus.
- Glymour, M. M., Kawachi, I., Jencks, C. S., & Berkman, L. F. (2008). Does childhood schooling affect old age memory or mental status? Using state schooling laws as natural experiments. *Journal of Epidemiology and Community Health*, 62 (6), 532-537.
- Gottfredson, L. S. (2004). Intelligence: Is it the epidemiologists' elusive "Fundamental cause" of social class inequalities in health? *Journal of Personality and Social Psychology*, 86, 174-199.
- Grinstead, L. N., Leder, S., Jensen, S., & Bond, L. (2003). Review of research on the health of caregiving grandparents. *Journal of Advanced Nursing*, 44, 318–326.
- Hank, K. (2007). Proximity and contacts between older parents and their adult children: A European comparison. *Journal of Marriage and Family*, 69, 157-173.
- Hank, K., & Buber, I. (2009). Grandparents caring for their grandchildren: findings from the 2004 survey of Health, Ageing, and Retirement in Europe. *Journal of Family Issues*, 30, 53-73.

- Hank, K., & Kreyenfeld, M. (2003). A multilevel analysis of child care and women's fertility decisions in Western Germany. *Journal of Marriage and Family*, 65, 584–96.
- Hantrais, L. (2005). Living as a family in Europe. In L. Hantrais, D. Philipov, and F. C. Billari (Eds.), *Policy implications of changing family formation* (pp. 117-181). Strasbourg: Council of Europe Publishing.
- Hauser, R. M., & Weir, D. (2010). Recent Developments in Longitudinal Studies of Aging in the United States. *Demography*, 47(Supplement), 111-30.
- Hayslip, B., & Kaminski, P. L. (2005). Grandparents raising their grandchildren: A review of the literature and suggestions for practice. *Gerontologist*, 45, 262-269.
- Horn, J. L., & Cattell, R. B. (1967). Age differences in fluid and crystallized intelligence. *Acta Psychologica*, 26, 107–129.
- Hughes, M. E., & Waite, L. J. (2002). Health in household context: Living arrangements and health in late middle age. *Journal of Health and Social Behavior*, 43, 1–21.
- Hughes, M. E., Waite, L. J., LaPierre, T. A., & Luo, Y. (2007). All in the family: The impact of caring for grandchildren on grandparents' health. *Journals of Gerontology Series B—Social Sciences*, 62, S108-S119.
- Jendrek, M. P. (1993). Grandparents who parent their grandchildren - effects on lifestyle. *Journal of Marriage and the Family*, 55, 609-621.
- Kalmijn, S., van Boxtel, M. P. J., Verschuren, M. W. M., et al. (2002). Cigarette smoking and alcohol consumption in relation to cognitive performance in middle age. *Am J Epidemiol*, 156, 936-944.
- Kohli, M. (1999). Private and public transfers between generations: Linking the family and the state. *European Societies*, 1, 81—104.
- Kornhaber, A. (1996). *Contemporary grandparenting*. Thousand Oaks, CA: SAGE Publications.
- Langer, E. J., & Rodin, J. (1976). Effects of choice and enhanced personal responsibility for aged – Field experiment in an institutional setting. *Journal of Personality and Social Psychology*, 34, 191-198.
- Le Carret, N., Laffont, S., Mayo, W., & Fabrigoule, C. (2003). The effect of education on cognitive performances and its implication for the constitution of the cognitive reserve. *Developmental Neuropsychology*, 23, 317-337.
- Mazzonna, F., & Peracchi, F. (2010). *Aging, cognitive abilities and retirement*. EIEF Working Papers Series 1015.
- Minkler, M. (1999). Intergenerational households headed by grandparents: Contexts, realities, and implications for policy. *Journal of Aging Studies*, 13, 199–209.
- Minkler, M., & Fuller-Thomson, E. (2005). African American grandparents raising grandchildren: A national study using the Census 2000 American Community Survey. *Journal of Gerontology: Social Sciences*, 60B, S82–S92.
- Monserud, M. A., & Elder, G. H. (2011). Household structure and children's educational attainment: A perspective on coresidence with grandparents. *Journal of Marriage and Family*, 73, 981–1000.
- Muller, Z., & Litwin, H. (2011). Grandparenting and psychological well-being: How important is grandparent role centrality? *European Journal of Ageing Volume*, 8, 109-118

- Murphy, M. J., & Grundy, E. (2003). Mothers with living children and children with living mothers: The role of fertility and mortality in the period 1911–2050. *Population Trends*, 112, 36–44
- Norman, S., Tröster, A. I., Fields, J. A. and Brooks, R. 2002. Effects of depression and Parkinson's disease on cognitive functioning. *Journal of Neuropsychiatry and Clinical Neurosciences*, 14, 31–36.
- Pebley, A. R., & Rudkin, L. L. (1999). Grandparents caring for grandchildren. What do we know? *Journal of Family Issues*, 20, 218-242.
- Popenoe, D. (1993). American family decline, 1960-1990: A review and appraisal. *Journal of Marriage and the Family*, 55, 527-542.
- Powdthavee, N. (2011). *Life satisfaction and grandparenthood: Evidence from a nationwide survey*. IZA Discussion Papers 5869, Institute for the Study of Labor (IZA).
- Pruchno, R. A. (1999). Raising grandchildren: The experiences of black and white grandmothers. *The Gerontologist*, 39, 209-221.
- Pruchno, R. A., & McKenney, D. (2002). Psychological well-being of Black and White grandmothers raising grandchildren: Examination of a two-factor model. *Journal of Gerontology: Psychological Sciences*, 57B, P444–P452.
- Rasquin, S. J., Lodder, R., Ponds, I., Winkens, J., Jolles, J., & Verhey, F. R. J. (2004). Cognitive functioning after stroke: A one-year follow-up study. *Dementia and Geriatric Cognitive Disorders*, 18, 138–44.
- Roe, K. M., Minkler, M., Saunders, F., & Thomson, G. E. (1996). Health of grandmothers raising children of the crack cocaine epidemic. *Medical Care*, 34, 1072-1084.
- Rohwedder, S., & Willis, R. J. 2010. Mental retirement. *Journal of Economic Perspectives*, 24, 119-138.
- Salthouse, T. A. (1985). *A theory of cognitive aging*. Amsterdam: North-Holland.
- Scarmeas, N., & Stern, Y. (2003). Cognitive reserve and lifestyle. *Journal of Clinical & Experimental Neuropsychology*, 25, 625–663.
- Schaie, K. W. (1989). The hazards of cognitive aging. *The Gerontologist*, 29, 484–493.
- Schaie, K. W., & Hofer, S. M. (2001). Longitudinal studies in research on aging. In J. E. Birren & K. W. Schaie (Eds.), *Handbook of the psychology of aging*, 5<sup>th</sup> edition (pp. 53-77). San Diego, CA: Academic Press.
- Schaie, K. W., & Willis, S. L. (1993). Age difference patterns of psychometric intelligence in adulthood: Generalizability within and across ability domains. *Psychology and Aging*, 8, 44-55.
- Schatz, J., & Buzan, R. (2006). Decreased corpus callosum size in sickle cell disease: Relationship with cerebral infarcts and cognitive functioning. *Journal of the International Neuropsychological Society*, 12, 24–33.
- Schmidt, R., Mechtler, L., Kinkel, P. R., Fazekas, F., Kinkel, W. R., & Freidl, W. (1993). Cognitive impairment after acute supratentorial stroke: A 6-month follow-up clinical and computed tomographic study. *European Archives of Psychiatry and Clinical Neuroscience*, 243, 11–15.



- Searle, M. S., Mahon, M. J., & Isoahola, S. E. (1995). Enhancing a sense of independence and psychological well-being among the elderly – A field experiment. *Journal of Leisure Research, 27*, 107-124.
- Silverstein, M. 2006. Intergenerational family transfers in social context. In R. K. Binstock & L. K. George (Eds.), *Handbook of aging and the social sciences*, 6<sup>th</sup> edition (pp. 165-180). Burlington, MA: Academic Press.
- Silverstein, M., & Bengtson, V. L. (1994). Does intergenerational social support influence the psychological well-being of older parents? The contingencies of declining health and widowhood. *Social Science and Medicine, 38*, 943-957.
- Silverstein, M., Giarrusso, R., & Bengtson, V. (1998). Intergenerational solidarity and the grandparent role. In M. Szinovacz (Ed.), *The handbook on grandparenthood* (pp. 144-158). Westport, CT: Greenwood.
- Silverstein, M., Giarrusso, R., & Bengtson, V. L. (2003). Grandparents and grandchildren in family systems: a social-developmental perspective. In V. L. Bengtson & A. Lowenstein (Eds.), *Global aging and challenges to families* (pp. 75-103). New York: Aldine de Gruyter.
- Solomon, J., & Marx, J. (1999). Who cares? Grandparent/grandchild households. *Journal of Women and Aging, 11*, 3–25.
- Stern Y. (2002). What is cognitive reserve? Theory and research application of the reserve concept. *Journal of the International Neuropsychological Society, 8*, 448-460.
- Trouton, A., Stewart, R., & Prince, M. (2006). Does social activity influence the accuracy of subjective memory deficit? Findings from a British community survey. *Journal of the American Geriatrics Society, 54*, 1108-1113.
- Umberson, D., Pudrovska, T., & Reczek, C. (2010). Parenthood, childlessness, and well-being: A life course perspective. *Journal of Marriage and Family, 72*, 612-629.
- Vandell, D. L., McCartney, K., Owen, M. T., Booth, C., & Clarke-Stewart, A. (2003). Variations in child care by grandparents during the first three years. *Journal of Marriage and Family, 65*, 375-381.
- Verbrugge, L. M., & Jette, A. M. (1994). The disablement process. *Social Science and Medicine, 38*, 1-14.
- Vollenwyder N., Bickel J.-F., Lalive d'Épinay C., & Maystre C. (2002). The elderly and their families : 1979-1994. Changing networks and relationships. *Current Sociology, 50*, 263-280.
- Zamarro G., Meijer E., & Fernandes M. (2008). Mental health and cognitive ability. In A. Börsch-Supan, A. Brugiavini, H. Jürges, A. Kapteyn, et al. (Eds.), *First results from the Survey of Health, Ageing and Retirement in Europe (2004-2007). Starting the longitudinal dimension*. Mannheim: Mannheim Research Institute for the Economics of Aging (MEA).
- Waldrop, D. P., & Weber, J. A. (2001). From grandparent to caregiver: The stress and satisfaction of raising grandchildren. *Families in Society, 82*, 461–472.
- Waldstein, S. R. (2000). Health effects on cognitive aging. In P. C. Stern & L. L. Carstensen (Eds.), *The aging mind: Opportunities in cognitive research* (pp. 189-217). Washington, DC: National Academy Press.

- Waldstein, S. R., & Elias, M. F. (2001). *Neuropsychology of cardiovascular disease*. Mahwah, NJ: Lawrence Erlbaum.
- Whalley, L. J., & Deary, I. J. (2001). Longitudinal cohort study of childhood IQ and survival up to age 76. *BMJ*, 322, 819.
- Wilson, R. S., Krueger, K. R., Arnold, S.E., Schneider, J. A., Kelly, J. F., Barnes, L. L., Tang, Y., & Bennett, D. A. (2007). Loneliness and risk of Alzheimer disease. *Archives of General Psychiatry*, 64 (2), 234-240.
- Winocur, G., Vardy, J., Binns, M. A., Kerr, L., & Tannock, I. (2006). The effects of the anti-cancer drugs, methotrexate and 5-fluorouracil, on cognitive function in mice. *Pharmacology, Biochemistry and Behavior*, 85, 66–75.
- World Health Organization, WHO. (1946). *Constitution of the World Health Organization*. Geneva: WHO.

**Appendix 1: Numeracy test in SHARE**

I) “If the chance of getting a disease is 10 percent, how many people out of one thousand would be expected to get the disease?”

If the first item was answered wrongly, the interviewee was asked the following question, after which the numeracy test was stopped, irrespective of whether the answer was correct.

“In a sale, a shop is selling all items at half price. Before the sale, a sofa costs 300 (local currency). How much will it cost in the sale?” If the first item was answered correctly, a second question was posed.

II) “A second hand car dealer is selling a car for 6,000 (local currency). This is two-thirds of what it costs new. How much did the car cost new?”

Only if both numeracy items were answered correctly, was the interviewee asked to answer a last question:

III) “Let's say you have 2,000 (local currency) in a savings account. The account earns ten percent interest each year. How much would you have in the account at the end of two years?”

## Appendix 2

Table A1 – OLS Estimates of the control variables included in the models of Table 3.

	Almost daily				Almost weekly			
	Verbal	Numeracy	Immediate recall	Delayed recall	Verbal	Numeracy	Immediate recall	Delayed recall
Education								
<i>(Ref.: low)</i>								
middle	1.885***	0.458***	0.559***	0.464***	1.907***	0.460***	0.562***	0.469***
	0.160	0.026	0.042	0.047	0.160	0.026	0.042	0.047
high	3.522***	0.716***	0.919***	0.78***	3.558***	0.718***	0.924***	0.787***
	0.187	0.03	0.048	0.054	0.187	0.030	0.048	0.054
Gender								
<i>(Ref.: Male)</i>								
Female	-0.012	-0.332***	0.314***	0.36***	-0.045	-0.334***	0.310***	0.355***
	0.141	0.023	0.037	0.041	0.142	0.023	0.037	0.041
Age								
Age	-0.130***	-0.011***	-0.046***	-0.052***	-0.132***	-0.011***	-0.046***	-0.053***
	0.011	0.002	0.003	0.003	0.011	0.002	0.003	0.003
Marital status								
<i>(Ref.: living alone)</i>								
living with a partner	0.489**	0.066*	0.116**	0.094*	0.472**	0.065*	0.115**	0.091
	0.164	0.027	0.042	0.048	0.165	0.027	0.043	0.048
Working status								
<i>(Ref.: other)</i>								
employed	1.079***	0.175***	0.222***	0.273***	1.103***	0.177***	0.226***	0.278***
	0.208	0.034	0.054	0.06	0.208	0.034	0.054	0.060
retired	0.464*	0.076*	0.138*	0.198**	0.449*	0.075*	0.135*	0.195**
	0.220	0.036	0.057	0.064	0.220	0.036	0.057	0.064
Country <i>(Ref.: Austria)</i>								
Germany	5.243***	0.229**	-0.288*	-0.563***	5.241***	0.229**	-0.288*	-0.562***
	0.559	0.088	0.141	0.159	0.559	0.088	0.141	0.159
Sweden	4.971***	0.251***	0.071	-0.327**	4.972***	0.251***	0.072	-0.326**
	0.391	0.063	0.101	0.114	0.391	0.063	0.101	0.114
Netherlands	7.04***	0.259***	-0.066	0.007	7.063***	0.261***	-0.061	0.015
	0.404	0.065	0.105	0.118	0.403	0.065	0.105	0.118
Spain	4.202***	0.307***	-0.075	-0.133	4.202***	0.309***	-0.071	-0.126
	0.393	0.064	0.102	0.115	0.392	0.064	0.102	0.115
Italy	-0.012	-0.44***	-1.189***	-1.091***	-0.016	-0.441***	-1.193***	-1.096***
	0.42	0.068	0.109	0.122	0.419	0.068	0.109	0.122
France	0.606	-0.179**	-0.584***	-0.758***	0.590	-0.181**	-0.589***	-0.766***
	0.397	0.064	0.103	0.116	0.397	0.064	0.103	0.116
Denmark	4.18***	-0.099	-0.601***	-0.724***	4.184***	-0.098	-0.598***	-0.720***
	0.393	0.064	0.102	0.114	0.392	0.064	0.102	0.114
Greece	5.917***	0.105	0.099	0.105	5.926***	0.106	0.102	0.111
	0.398	0.065	0.103	0.116	0.398	0.065	0.103	0.116
Switzerland	-0.132	0.151*	-0.129	-0.356**	-0.144	0.149*	-0.133	-0.364**

*Do elderly benefit from grandparenting in terms of cognitive abilities?*

	0.402	0.065	0.105	0.118	0.402	0.065	0.105	0.118
Belgium	5.502***	0.39***	-0.04	-0.259*	5.509***	0.392***	-0.036	-0.252
	0.444	0.072	0.115	0.13	0.444	0.072	0.115	0.130
Israel	4.1***	-0.067	-0.3**	-0.686***	4.067***	-0.068	-0.301**	-0.687***
	0.435	0.071	0.113	0.127	0.435	0.071	0.113	0.127
Czech Republic	3.266***	0.093	-0.569***	-0.9***	3.211***	0.091	-0.575***	-0.909***
	0.388	0.063	0.101	0.113	0.388	0.063	0.101	0.113
Poland	5.205***	0.301***	-0.007	-0.378***	5.184***	0.300***	-0.009	-0.379***
	0.382	0.062	0.099	0.111	0.382	0.062	0.099	0.111
Ireland	0.986*	-0.209**	-0.808***	-1.04***	0.884*	-0.216***	-0.827***	-1.070***
	0.394	0.064	0.102	0.115	0.392	0.064	0.102	0.115
_cons	21.435***	3.846***	7.374***	6.503***	21.506***	3.848***	7.378***	6.508***
	0.809	0.131	0.21	0.235	0.810	0.131	0.210	0.235
N	7863	8005	7974	7940	7863	8005	7974	7940

Source: SHARE, 2004; 2006. Authors' elaboration.

Table A2 – 2SLS Estimates of the effect of the control variables included in the models of

Table 4.

Variable	Almost daily				Almost weekly			
	fluency	numeracy	immediate recall	delayed recall	fluency	numeracy	immediate recall	delayed recall
Education (Ref.: low)								
middle	2.009***	0.456***	0.569***	0.477***	1.955***	0.457***	0.566***	0.473***
	0.164	0.027	0.042	0.047	0.160	0.027	0.041	0.047
high	3.695***	0.712***	0.933***	0.799***	3.643***	0.714***	0.930***	0.795***
	0.196	0.030	0.051	0.056	0.192	0.030	0.050	0.055
Gender (Ref.: Male)								
Female	-0.132	-0.330***	0.304***	0.347***	-0.129	-0.330***	0.304***	0.347***
	0.147	0.023	0.038	0.042	0.146	0.023	0.038	0.042
Age								
Age	-0.136***	-0.011***	-0.046***	-0.053***	-0.138***	-0.011***	-0.046***	-0.053***
	0.011	0.002	0.003	0.003	0.011	0.002	0.003	0.003
Marital status (Ref.: living alone)								
living with a partner	0.431**	0.067*	0.112**	0.087	0.428**	0.067*	0.112**	0.087
	0.167	0.027	0.043	0.048	0.165	0.027	0.043	0.048
Working status (Ref.: other)								
employed	1.213***	0.172***	0.233***	0.287***	1.155***	0.174***	0.229***	0.283***
	0.209	0.034	0.055	0.061	0.206	0.034	0.055	0.061
retired	0.371	0.078*	0.131*	0.189**	0.415*	0.077*	0.133*	0.192**
	0.214	0.036	0.058	0.064	0.211	0.036	0.058	0.064
Country								

<i>(Ref.: Austria)</i>								
Germany	5.257***	0.228**	-0.286	-0.560**	5.231***	0.230**	-0.289	-0.564***
	0.625	0.088	0.154	0.171	0.620	0.088	0.153	0.171
Sweden	5.003***	0.250***	0.073	-0.324*	4.973***	0.251***	0.072	-0.326*
	0.395	0.062	0.110	0.130	0.390	0.062	0.110	0.130
Netherlands	7.226***	0.255***	-0.050	0.028	7.107***	0.259***	-0.057	0.019
	0.414	0.065	0.111	0.130	0.408	0.065	0.111	0.130
Spain	4.374***	0.304***	-0.061	-0.113	4.179***	0.310***	-0.073	-0.128
	0.391	0.064	0.111	0.131	0.386	0.063	0.110	0.130
Italy	-0.168	-0.437***	-1.201***	-1.106***	-0.010	-0.442***	-1.192***	-1.095***
	0.418	0.065	0.120	0.134	0.408	0.065	0.120	0.134
France	0.401	-0.175**	-0.600***	-0.780***	0.571	-0.180**	-0.590***	-0.768***
	0.401	0.063	0.109	0.131	0.391	0.063	0.109	0.130
Denmark	4.272***	-0.101	-0.593***	-0.713***	4.183***	-0.098	-0.598***	-0.720***
	0.401	0.063	0.111	0.128	0.397	0.063	0.111	0.127
Greece	6.060***	0.102	0.111	0.122	5.935***	0.106	0.103	0.112
	0.405	0.065	0.110	0.130	0.401	0.065	0.109	0.129
Switzerland	-0.320	0.155*	-0.143	-0.376**	-0.156	0.150*	-0.134	-0.365**
	0.387	0.063	0.109	0.132	0.377	0.063	0.109	0.132
Belgium	5.672***	0.387***	-0.026	-0.240	5.507***	0.392***	-0.036	-0.253
	0.451	0.070	0.124	0.146	0.447	0.070	0.123	0.146
Israel	4.086***	-0.067	-0.301*	-0.687***	3.969***	-0.063	-0.308*	-0.695***
	0.419	0.065	0.121	0.142	0.416	0.065	0.121	0.142
Czech Republic	3.053***	0.097	-0.585***	-0.923***	3.076***	0.097	-0.584***	-0.921***
	0.393	0.061	0.110	0.124	0.386	0.061	0.110	0.124
Poland	5.160***	0.302***	-0.010	-0.381**	5.125***	0.303***	-0.012	-0.384**
	0.396	0.060	0.105	0.125	0.390	0.060	0.104	0.125
Ireland	0.251	-0.193**	-0.866***	-1.119***	0.677	-0.207**	-0.841***	-1.088***
	0.416	0.069	0.115	0.136	0.374	0.063	0.108	0.129
_cons	21.564***	3.844***	7.383***	6.515***	21.700***	3.839***	7.391***	6.525***
	0.814	0.134	0.215	0.241	0.807	0.135	0.215	0.240
N	7863	8005	7974	7940	7863	8005	7974	7940

Source: SHARE, 2004; 2006. Authors' elaboration.

Table A3 – Summary results for first-stage regressions.

		Verbal fluency	Numeracy	Immediate recall	Delayed recall
Variable: Almost daily	Partial R2	0.099	0.098	0.098	0.099
	F	F(1, 7840)	F(1, 7982)	F(1, 7951)	F(1, 7917)
	p-value	884.54	889.58	887.41	890.93
		0.000	0.000	0.000	0.000
Variable: Almost weekly	Partial R2	0.343	0.344	0.343	0.343
	F	F(1, 7840)	F(1, 7982)	F(1, 7951)	F(1, 7917)
	p-value	3924.14	4002.41	3991.74	3986.66
		0.000	0.000	0.000	0.000

Source: SHARE, 2004; 2006. Authors' elaboration.